

GS34063

DC-To-DC Converter Control Circuits

DEC. 2009

Product Description

The GS34063 Series is a monolithic control circuit containing the primary functions required for DC-to-DC converters.

These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch.

This series was specifically designed to be incorporated in Step-Down and step-Up and Voltage-Inverting applications with a minimum number of external components.

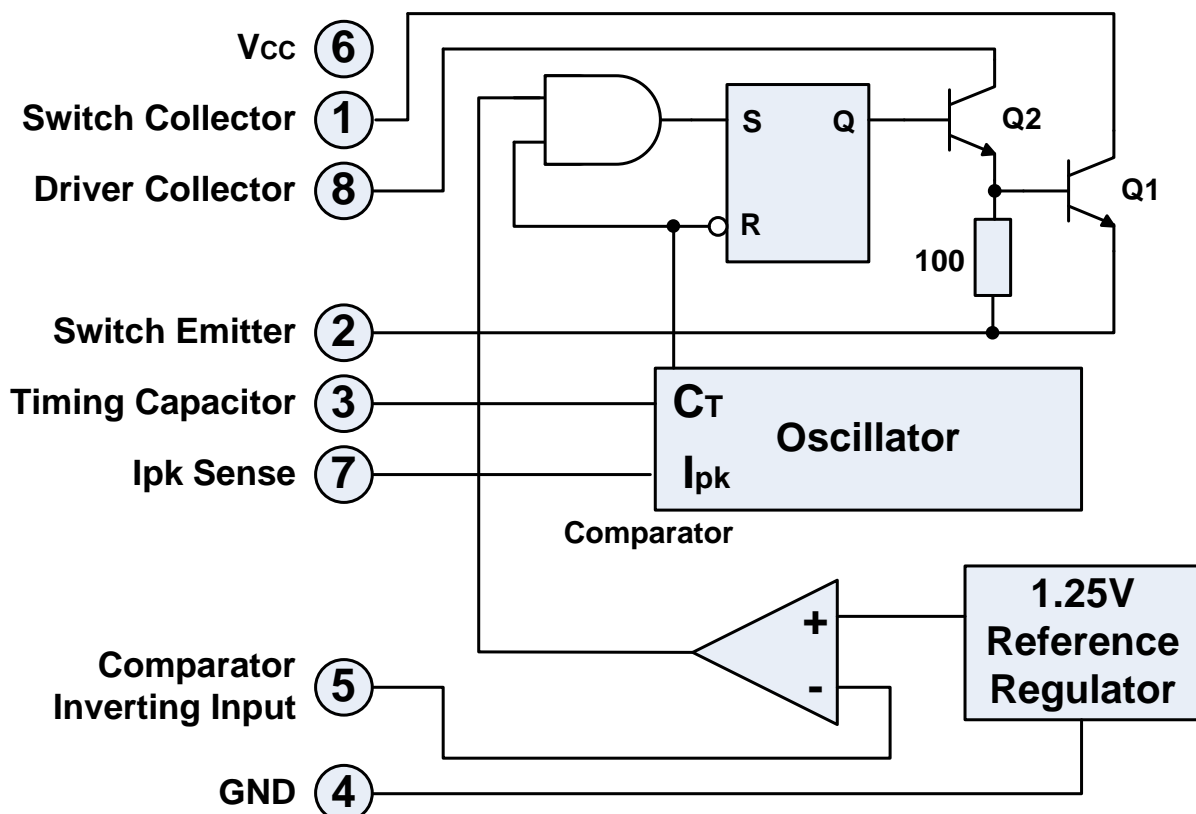
Features

- Operation from 3.0V to 40V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.5A
- Output Voltage Adjustable
- Frequency Operation to 100kHz
- Precision 2% Reference

Applications

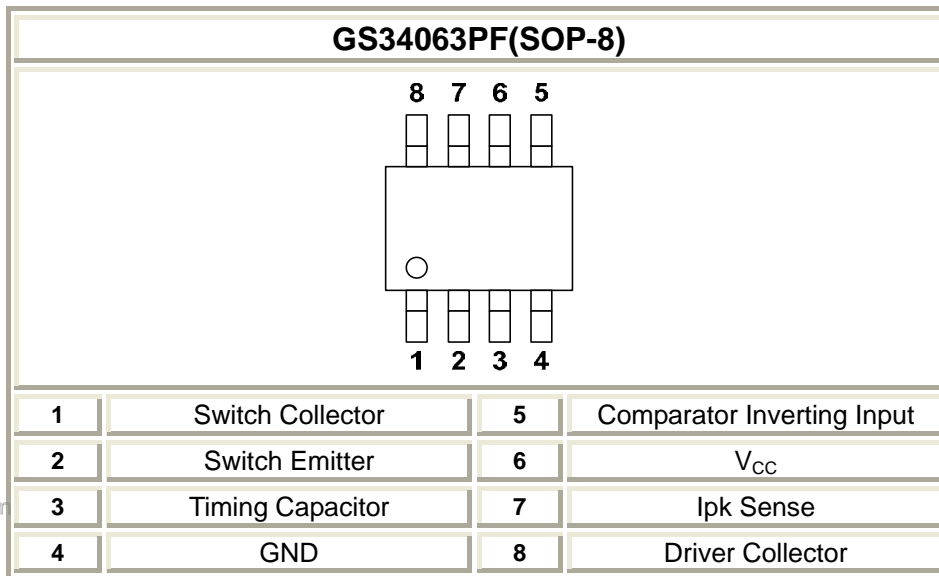
- Battery Powered Applications
- Laptop/Notebook Computers
- Power Inverter (+ to -) or (- to +)
- Medical Instruments
- Interface Power Supplies
- Portable Instruments
- Cellular Phones/Radio

Block Diagram



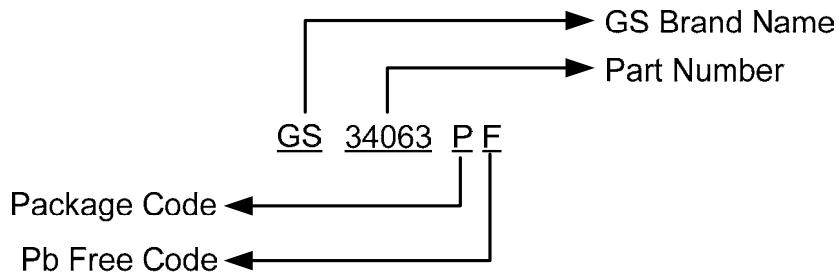
GS34063

Packages & Pin Assignments



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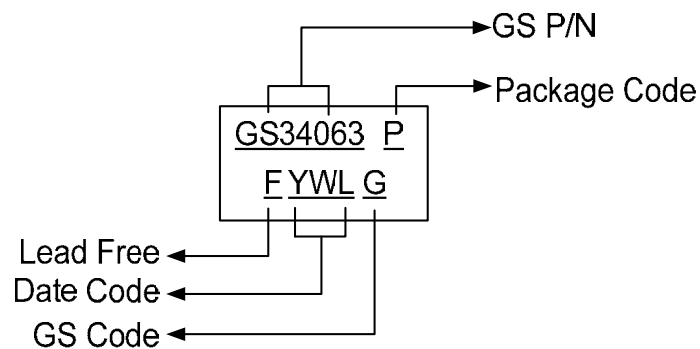
Ordering Information



Device	Package
GS34063PF	DIP-8
GS34063SF	SOP-8

For additional available fixed voltages, please contact factory.

Marking Information



GS34063

Absolute Maximum Ratings

Symbol	Parameter	Rating		Unit
V_{CC}	Power Supply Voltage	40		V
V_{IR}	Comparator Input Voltage Range	-0.3 to +40		V
$V_{C(switch)}$	Switch Collector Voltage	40		V
$V_{E(switch)}$	Switch Emitter Voltage ($V_{PIN1}=40V$)	40		V
$V_{CE(switch)}$	Switch Collector to Emitter Voltage	40		V
$V_{C(driver)}$	Driver Collector Voltage	40		V
$I_{C(driver)}$	Driver Collector Current (Note 1)	100		mA
I_{sw}	Switch Current	1.5		A
P_D	Power Dissipation $T_A=25^{\circ}C$	SOP-8	0.625	W
		DIP-8	1.25	
θ_{Jc}	Thermal Resistance(Junction to Case) $T_A=25^{\circ}C$	SOP-8	20	$^{\circ}C/W$
		DIP-8	45	
θ_{JA}	Thermal Resistance(Junction to Ambient) $T_A=25^{\circ}C$	SOP-8	150	$^{\circ}C/W$
		DIP-8	100	
T_J	Operating Junction Temperature	+150		$^{\circ}C$
T_A	Operating Ambient Temperature Range	0 to +70		$^{\circ}C$
T_{STG}	Storage Temperature Range	-65 to +150		$^{\circ}C$

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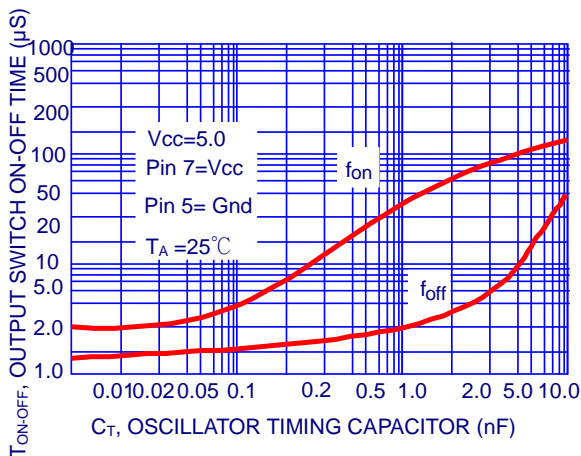
Electrical Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Oscillator						
F _{OSC}	Frequency	V _{pin5} =0V, C _T =1.0nF, T _A =25°C	24	33	42	kHz
I _{CHG}	Charge Current	V _{CC} =5.0V to 40V, T _A =25°C	24	35	42	μA
I _{DISCHG}	Discharge Current	V _{CC} =5.0V to 40V, T _A =25°C	140	220	260	μA
I _{DISCHG} / I _{CHG}	Discharge to Charge Current Ratio	Pin 7 to V _{CC} , T _A =25°C	5.2	6.5	7.5	--
V _{IPK(SENCE)}	Current Limit sense Voltage	I _{CHG} =I _{DISCHG} , T _A =25°C	250	300	350	mV
Output Switch (NOTE 2)						
V _{CE(sat)}	Saturation Voltage, Darlington Connection	I _{SW} =1.0A, Pins 1, 8 connected	--	1.0	1.3	V
V _{CE(sat)}	Saturation Voltage, Darlington Connection	I _{SW} =1.0A, R _{PIN8} =82Ω to V _{CC} , Forced β ≈ 20	--	0.45	0.7	V
H _{FE}	DC Current Gain	I _{SW} =1.0A, V _{CE} =5.0V, T _A =25°C	50	75	--	--
I _{C(off)}	Collector Off-state Current	V _{CE} =40V	--	40	100	μA
Comparator						
V _{TH}	Threshold Voltage	T _A =25°C (T _A =T _{LOW} to T _{HIGH})	1.225 1.21	1.25 --	1.275 1.29	V
REG _(LINE)	Threshold Voltage Line Regulation	V _{CC} =3.0V to 40V	--	1.4	5.0	mV
I _{IB}	Input Bias Current	V _{in} =0V	--	-20	-400	nA
Total Device						
I _{CC}	Supply Current	V _{CC} =5.0V to 40V, C _T =1.0nF, Pin 7=V _{CC} , V _{PIN5} >V _{TH} , Pin 2=GND, remaining pins open	--	--	4.0	mA

NOTE1: Maximum package power dissipation limits must be observed.

NOTE2: Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.

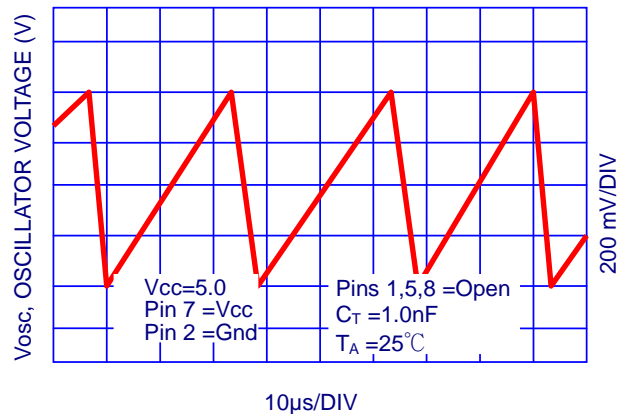
Typical Performance Characteristics



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Figure 1.

Output Switch On-Off Time Versus Oscillator Timing Capacitor



10µs/DIV

Figure 2

Timing Capacitor Waveform.

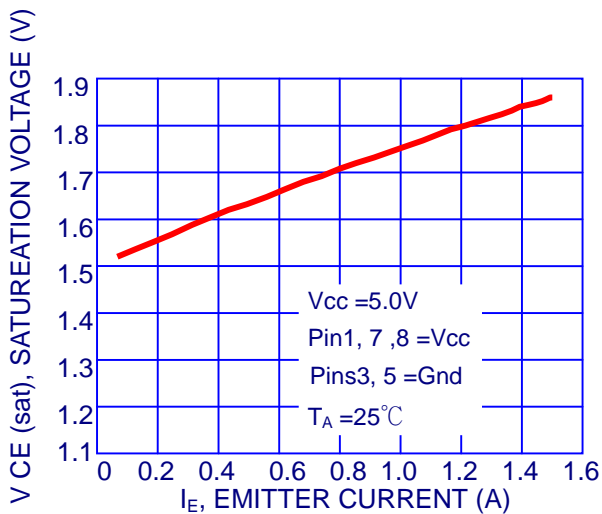


Figure 3.

Emitter Follower Configuration Output Saturation Voltage versus Emitter Current

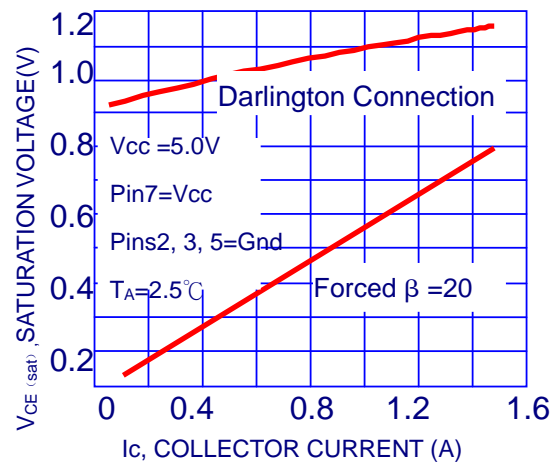


Figure 4.

Common Emitter Configuration Output Switch Saturation Voltage versus Collector Current

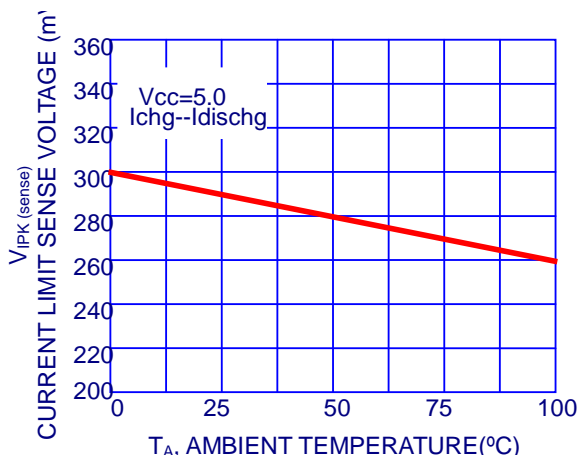


Figure 5.

Current Limit Sense Voltage versus Temperature

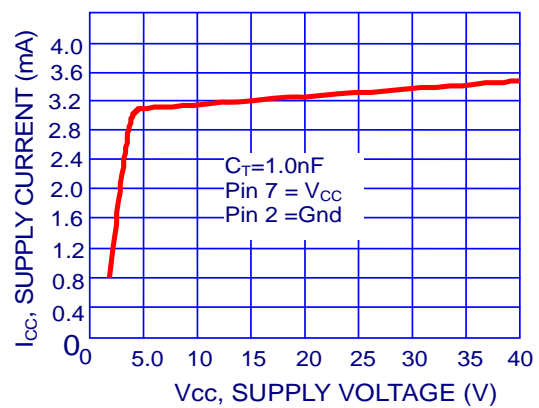
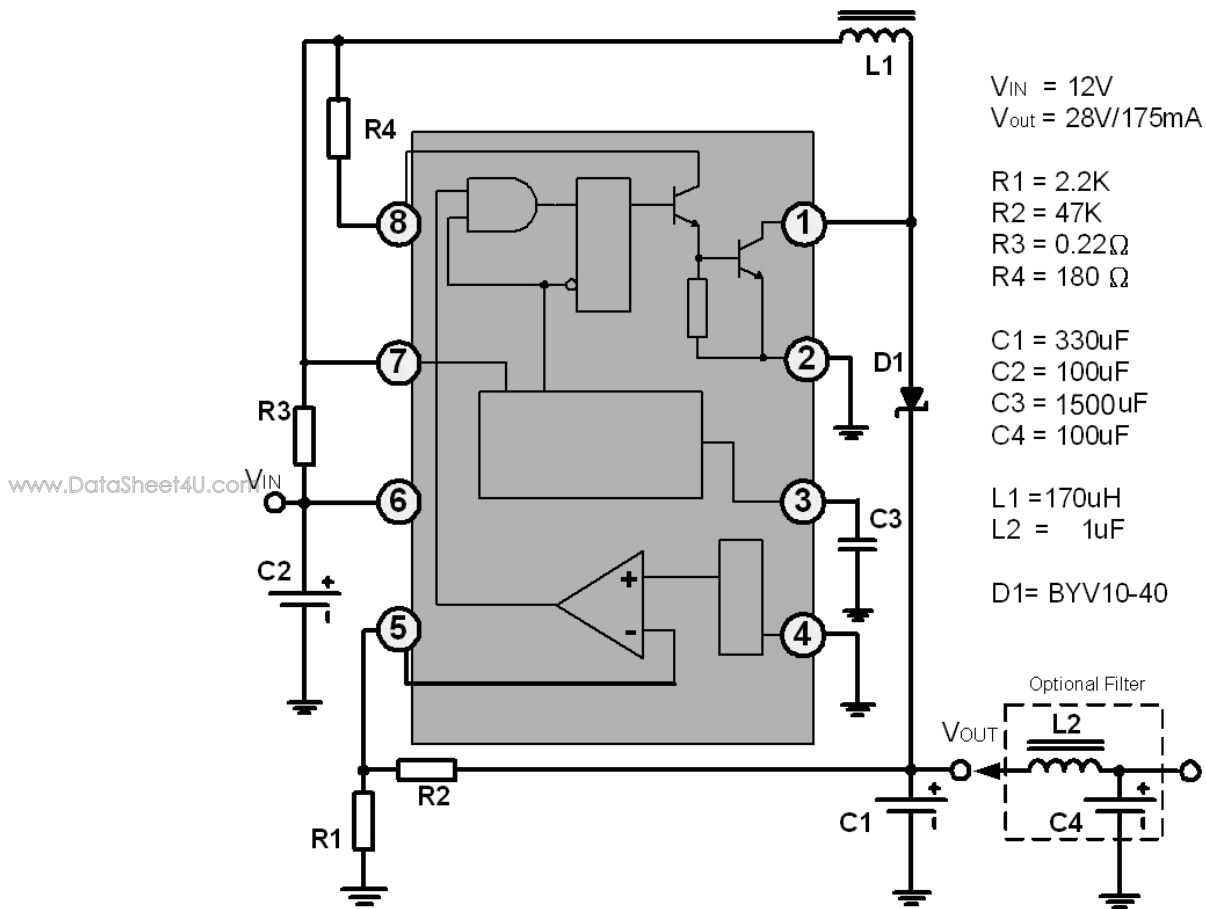


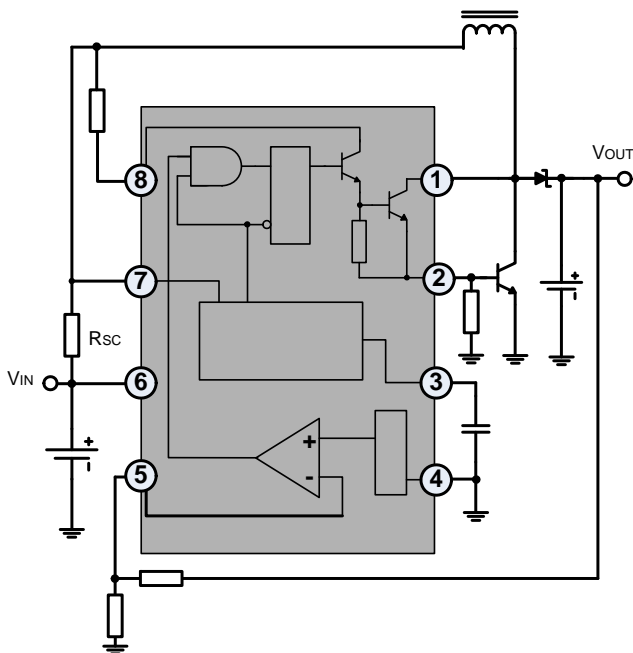
Figure 6.

Standby Supply Current versus supply Voltage

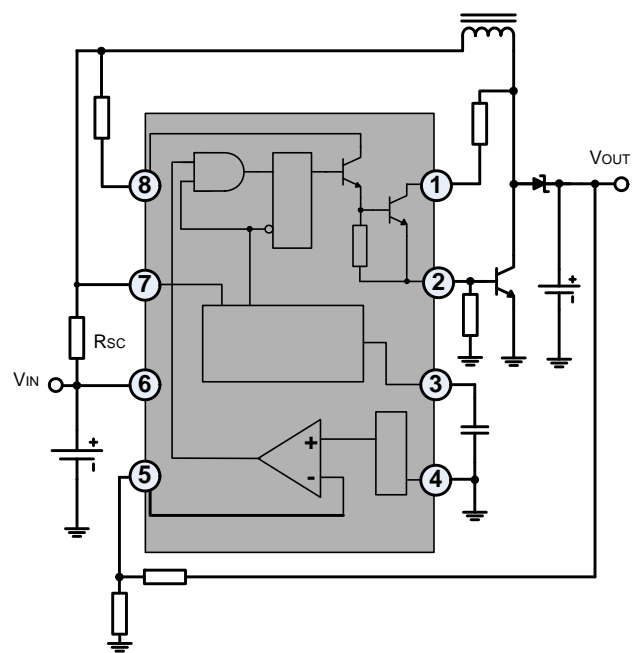
Typical Applications Circuit



Step-Up Converter

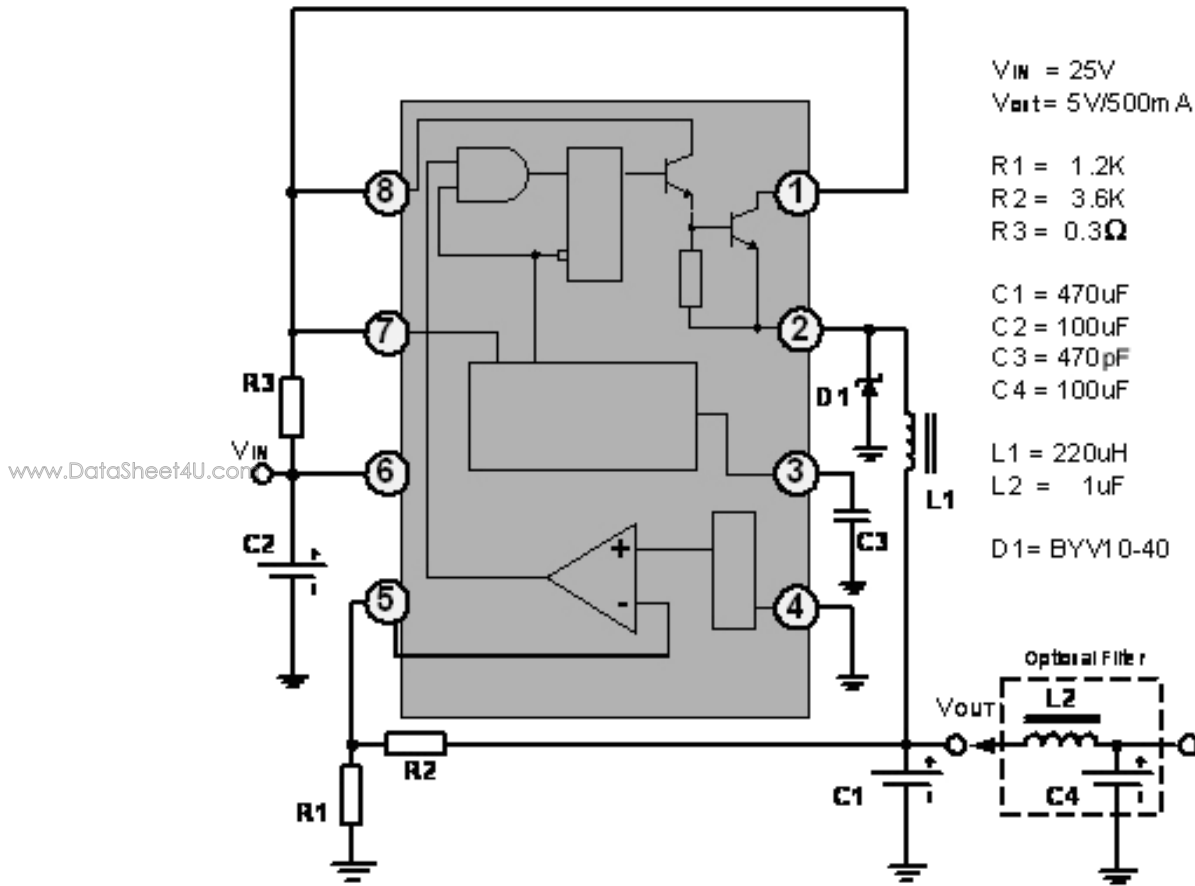


Step-Up With External NPN Switch

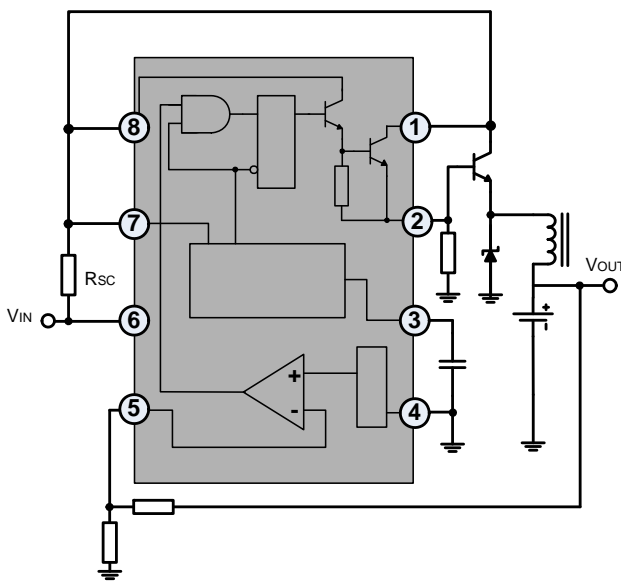


Step-Up With External NPN Saturated Switch (See Note 5)

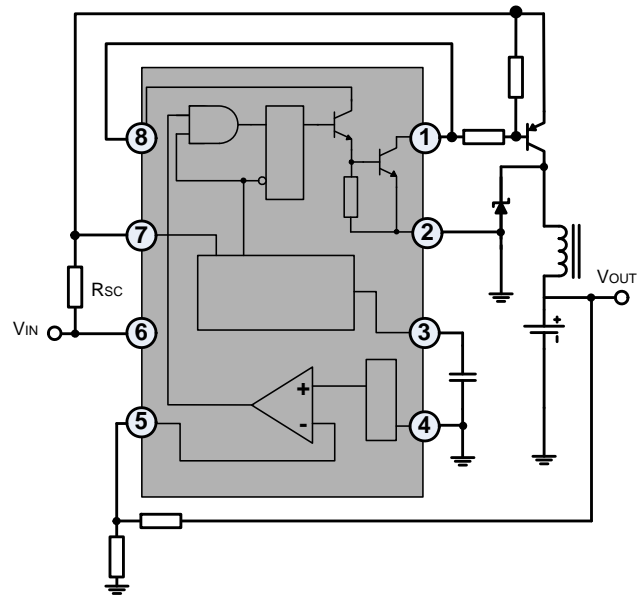
Typical Applications Circuit (Continued)



Step-Down Converter

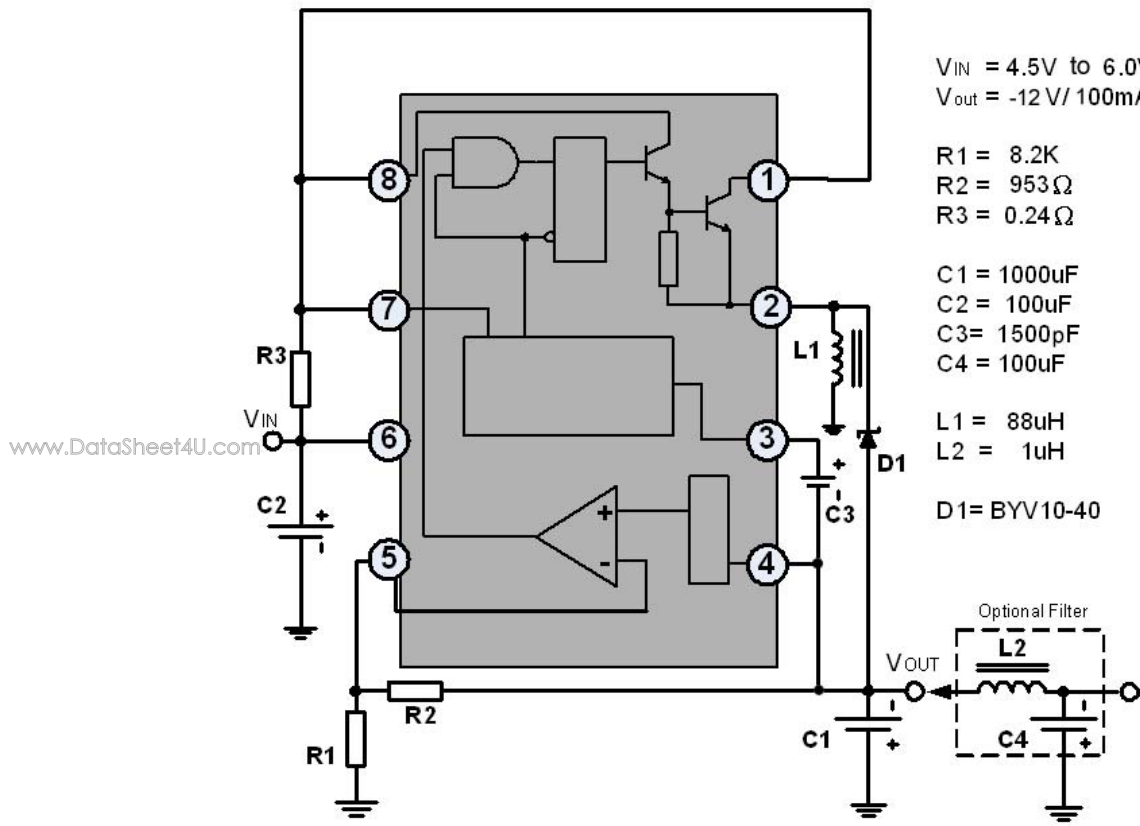


Step-Down With External NPN Switch

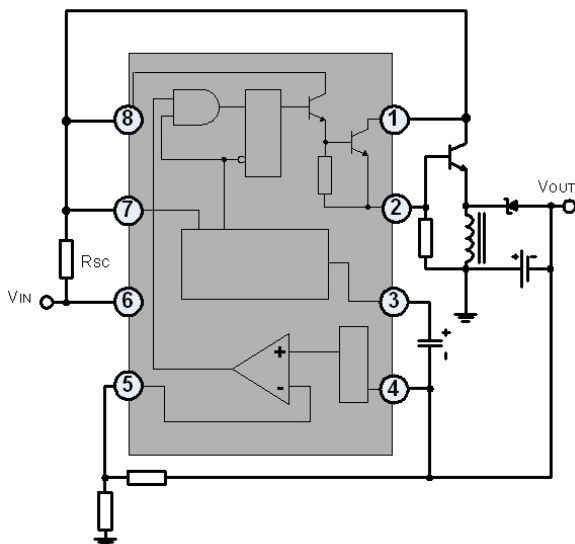


Step-Down With External PNP Saturated Switch

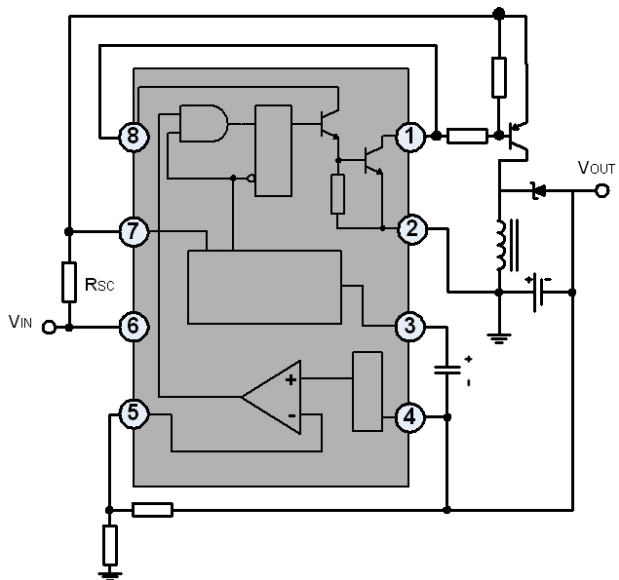
Typical Applications Circuit (Continued)



Voltage Inverting Converter

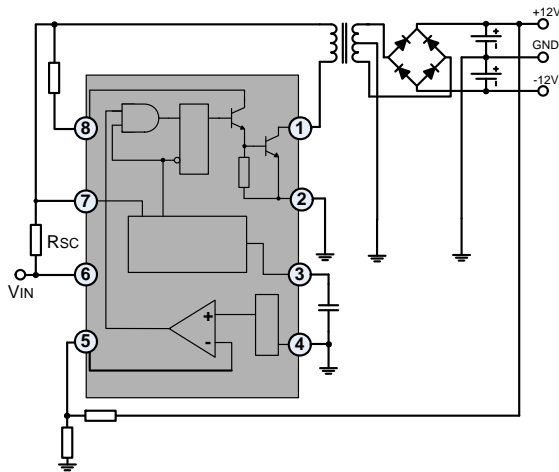


Voltage Inverting With External NPN Switch

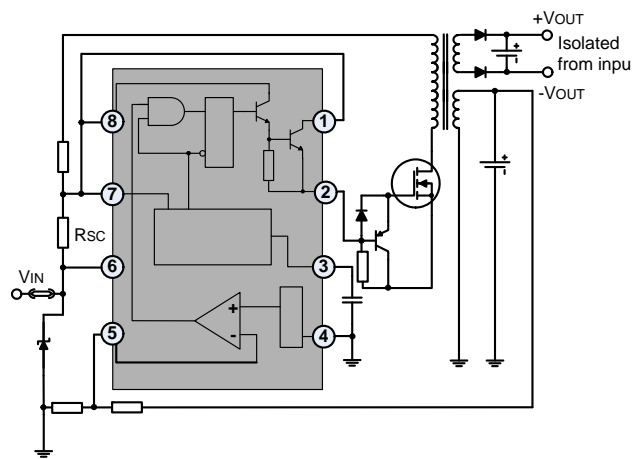


Voltage Inverting With External NPN Saturated Switch

Typical Applications Circuit (Continued)



Dual Output Voltage



Higher Output Power ,
Higher Input Voltage

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Design Formula Table

Calculation	Step-Up	Step-Down	Voltage-Inverting
t_{ON} / t_{OFF}	$\frac{V_{OUT} + V_F - V_{IN(MIN)}}{V_{IN(MIN)} - V_{SAT}}$	$\frac{V_{OUT} + V_F}{V_{IN(MIN)} - V_{SAT} - V_{OUT}}$	$\frac{ V_{OUT} + V_F}{V_{IN} - V_{SAT}}$
$(t_{ON} + t_{OFF})_{MAX}$	$\frac{1}{f_{MIN}}$	$\frac{1}{f_{MIN}}$	$\frac{1}{f_{MIN}}$
C_T	$4.0 \times 10^{-5} t_{ON}$	$4.0 \times 10^{-5} t_{ON}$	$4.0 \times 10^{-5} t_{ON}$
$I_{PK(SWITCH)}$	$2 I_{OUT(MAX)} \left(\frac{t_{ON}}{t_{OFF}} + 1 \right)$	$2 I_{OUT(MAX)}$	$2 I_{OUT(MAX)} \left(\frac{t_{ON}}{t_{OFF}} + 1 \right)$
R_{SC}	$0.3 / I_{PK(SWITCH)}$	$0.3 / I_{PK(SWITCH)}$	$0.3 / I_{PK(SWITCH)}$
$L_{(MIN)}$	$\frac{V_{IN(MIN)} - V_{SAT}}{I_{PK(SWITCH)}} t_{ON(MAX)}$	$\frac{V_{IN(MIN)} - V_{SAT} - V_{OUT}}{I_{PK(SWITCH)}} t_{ON(MAX)}$	$\frac{V_{IN(MIN)} - V_{SAT}}{I_{PK(SWITCH)}} t_{ON(MAX)}$
C_O	$9 \frac{I_{OUT} t_{ON}}{V_{RIPPLE(PP)}}$	$\frac{I_{PK(SWITCH)}(t_{ON} + t_{OFF})}{8 V_{RIPPLE(PP)}}$	$9 \frac{I_{OUT} t_{ON}}{V_{RIPPLE(PP)}}$

Terms And Defintions

V_{SAT} : Saturation voltage of the output switch.

V_F : Forward voltage drop of the output rectifier.

The following power supply characteristics must be chosen:

V_{IN} : Nominal input voltage

V_{OUT} : Desired output voltage, $|V_{OUT}| = 1.25(1 + R_2/R_1)$

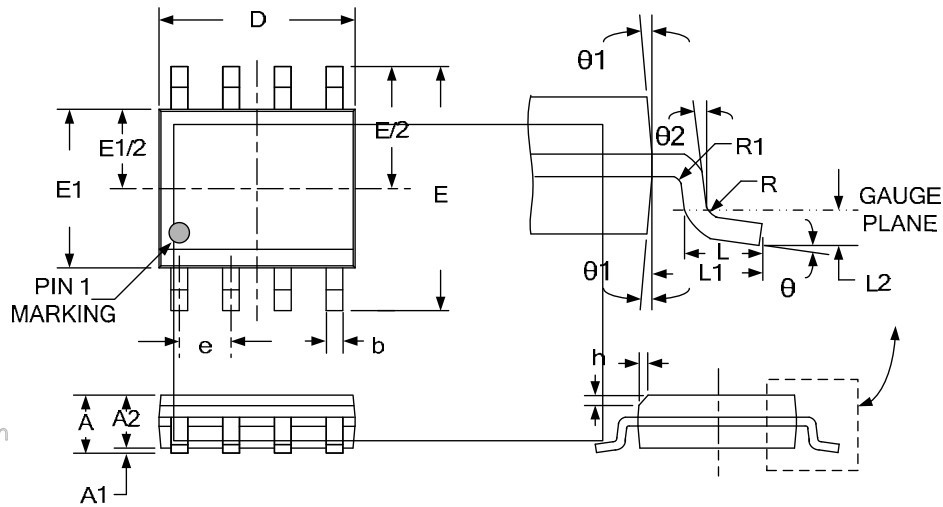
I_{OUT} : Desired output current.

f_{MIN} : Minimum desired output switching frequency at the selected values of V_{in} and I_o .

$V_{RIPPLE(PP)}$: Desired peak-to-peak output ripple voltage. In practice, the calculated capacitor value will need to be increased due to its equivalent series resistance and board layout. The ripple voltage should be kept to low value since it will directly affect the line and load regulation.

Package Dimension

SOP-8 PLASTIC PACKAGE

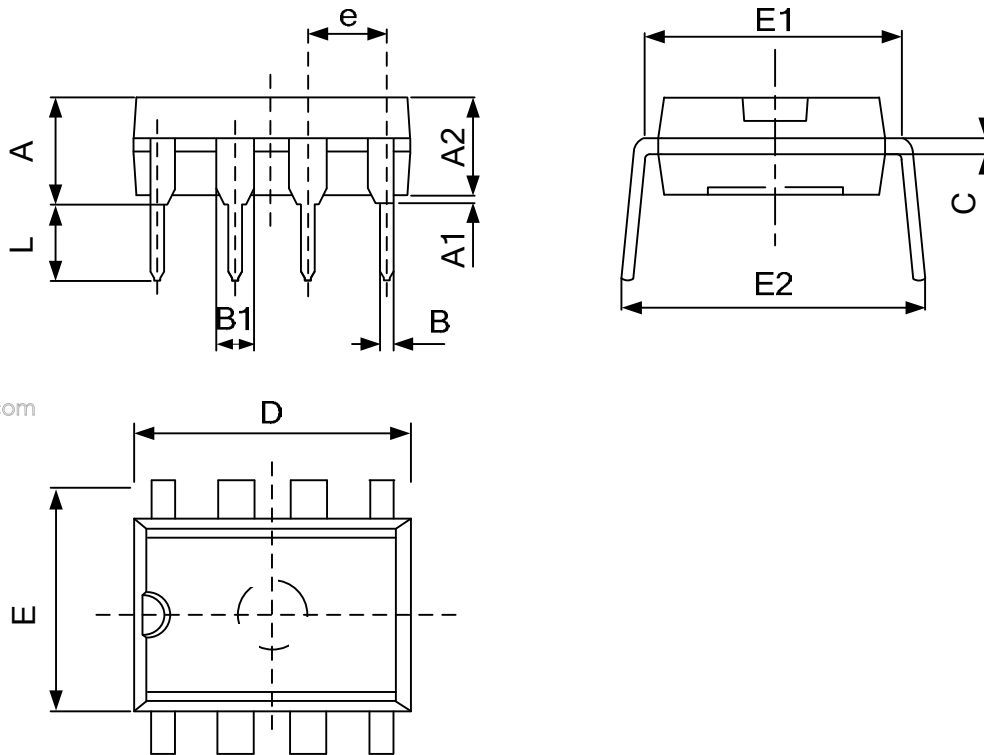


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Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	.053	.069
A1	0.10	0.25	.004	.010
A2	1.25	1.65	.049	.065
b	0.31	0.51	.012	.020
c	0.17	0.25	.007	.010
D	4.90 (TYP)		.193 (TYP)	
E	6.00 (TYP)		.236 (TYP)	
E1	3.90 (TYP)		.154 (TYP)	
e	1.27 (TYP)		.050 (TYP)	
L	0.40	1.27	.016	.050
L1	1.04 (TYP)		.041 (TYP)	
L2	0.25 (TYP)		.010 (TYP)	
R	0.07	-	.003	-
R1	0.07	-	.003	-
h	0.25	0.50	.010	.020
θ	0°	8°	0°	8°
θ1	5°	15°	5°	15°
θ2	0°	-	0°	-

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DIP-8 PLASTIC PACKAGE



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Dimensions				
SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	3.710	4.310	.146	.170
A1	0.510	-	.020	-
A2	3.200	3.600	.126	.142
B	0.380	0.570	.015	.022
B1	1.524(BSC)		0.060 (BSC)	
C	0.204	0.360	.008	.014
D	9.000	9.400	.354	.370
E	6.200	6.600	.244	.260
E1	7.320	7.920	.288	.312
e	2.540(BSC)		.100 (BSC)	
L	3.000	3.600	.118	.142
E2	8.400	9.000	.331	.354





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